

EFFECTS OF WEIKART'S SEQUENTIAL APPROACH TO RHYTHMIC  
MOVEMENT ON DEVELOPMENT OF RHYTHMIC COMPETENCY IN PRIMARY  
AGE CHILDREN

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A Field Report  
Presented to  
The College of Arts and Sciences  
Drake University

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In Partial Fulfillment  
of the Requirements for the Degree  
Master of Music Education

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by  
Patricia B. Trump  
August, 1987

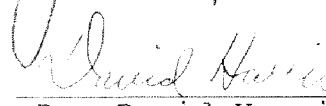
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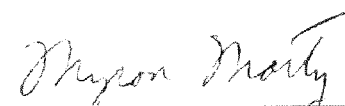
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# EFFECTS OF WEIKART'S SEQUENTIAL APPROACH TO RHYTHMIC MOVEMENT ON DEVELOPMENT OF RHYTHMIC COMPETENCY IN PRIMARY AGE CHILDREN

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## Problem.

The purpose of this study was to compare the rhythmic competency of children receiving training using Weikart's Sequential Approach to Rhythmic Movement, and those receiving no training. Variables included gender and task alteration.

## Procedure.

The sample consisted of 54 first graders. The Rhythmic Competency Analysis Test (RCAT) was administered to measure initial rhythmic competency. The experimental group received approximately 25 five-minute training sessions over a period of four months. Lessons were taken from Weikart's book, Music and Movement. The control group received no special training in rhythmic movement. An equivalent form of the RCAT was administered to all subjects at the end of the treatment period.

## Findings.

RCAT data was treated statistically with  $t$  tests and with a 2(gender) x 2(instruction) factorial analysis of variance design. During the treatment period the subjects made significant improvement in RCAT scores,  $p < .001$ . Results showed locomotor tasks to be significantly more difficult than nonlocomotor tasks,  $p < .001$ . Gender was found to be significant only for Task 1 (patting bilaterally),  $p < .05$ . The experimental group made significantly better progress than the control group for locomotor tasks,  $p < .05$ , but there were no significant differences due to instruction for nonlocomotor tasks.

## Conclusions.

The study concluded that while maturation was important to the development of rhythmic competency, instruction using Weikart's method could improve performance, particularly locomotor skills. It was also found that the method of instruction could be implemented into a primary school music curriculum with a minimum investment of time and money.

## Recommendations.

The study recommends that training in rhythmic movement be incorporated into elementary music classes, and that greater emphasis be placed on locomotor movement activities. Further research using an improved scoring method and a larger sample is needed in order to clarify the effects of gender and to generalize these findings to other populations.

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## CHAPTER I

### INTRODUCTION

A primary purpose of education is the development of basic competencies. Both the National Institute of Education and the United States Department of Education have identified aesthetic education as a part of the nation's basic skills priority area (Wyckoff, 1980, p. 65). Contemporary philosophies stress a strong connection between music education and the development of aesthetic skills (Mark, 1982; Reimer, 1970; Schwadron, 1965). Beginning with the assumptions that music education is aesthetic education and that aesthetic education is a national priority, it is logical to conclude that music instruction must be a part of public education.

To accomplish its mandate to develop aesthetic competencies, music education in the public schools must be comprehensive. It should encompass all domains of learning, including the development of motor/performance skills (Ernst and Gary, 1965). Appropriate training in performance skills is particularly crucial during the primary grades if these skills are to be mastered (Britton, 1964; DeYarmin, 1977; Gordon, 1981; Zimmerman, 1971).

Performance skills are included in every comprehensive music education program for children because grasping the aesthetic import of music is best served through direct participation (Schwadron, 1970, p. 65). Britton (1964) states, "The fundamental approach to music should be through its performance" (p. 45). Since rhythm is in many ways the very essence of music (Cooper and Meyer, 1960; Creston, 1961; Stravinsky, 1962; Winold, 1975), and because the ability to perform rhythms is directly related to musical performance (Boyle, 1970), rhythmic instruction should be a part of the musical training of young children.

Music theorists and physical education experts concur that pulse is the basis of rhythmic expression. Gordon (1981) believes that awareness of the beat is the beginning of rhythmic development. According to Weikart (1982), the foundation of rhythmic movement, whether applied to dance, sport, or musical performance, is the ability to perceive an external pulse and to synchronize body movement to it. Weikart calls this ability "rhythmic competency". The development of rhythmic competency is the basis upon which all rhythmic instruction must rest.

#### Need for the Study

Weikart maintains that the lack of rhythmic competency is a serious impediment to the development of rhythmic skills among young children; one that impairs their ability



to succeed in musical activities. In the supplement Music, Movement, and Dance: A Sequential Approach (1986, p. 11), Weikart states that only about 20% of children enter school rhythmically competent. There is an apparent need for early intervention by music educators at the elementary school level.

Mursell (1956) wrote that one of the primary goals of music education should be ". . . to bring to children experiences of successful achievement [italics added] in and through their dealings with music" (p. 45). If rhythmic competency is a prerequisite to success in musical performance, educators have a responsibility to initiate teaching methods that will insure the development of this skill. Toward this end, the following questions must be answered: (1) Can the development of rhythmic competency be aided by instruction? (2) If so, what method of instruction is most effective? (3) Is the method practical and economical in terms of both cost and instructional time?

Radocy and Boyle (1979, p. 286) state that the development of skills through maturation alone is not learning. Energy should not be wasted teaching skills that would develop naturally without instruction. Research should attempt to establish whether the development of rhythmic competency is solely a factor of maturation, or is subject to the influence of training.

Madsen (1970) maintains that the proper role of research is to provide more efficient ways to solve problems. While educators may accept the assumption that the lack of rhythmic competency in children is a legitimate problem, there is little agreement on how to provide instruction. Because gains in learning are inevitably linked to the quality of instruction, music teachers must have access to credible information about methodology if they are to improve the rhythmic competency of their students. This can be accomplished most efficiently through teacher-initiated classroom research (Cross, 1987).

The current societal demand for excellence in education places a burden upon music teachers to carefully assess strategies for teaching musical skills. Limited resources demand the identification of methods that are practical as well as effective. There is clearly a need to examine methods for teaching rhythmic competency, and to do so within the public school environment.

#### Definition of Weikart's Sequential Approach

The specific method examined in this study is Weikart's sequential approach to rhythmic movement as outlined in her textbook, Teaching Rhythm and Dance: A Sequential Approach to Rhythmic Movement (1982), the supplement Music, Movement, and Dance: A Sequential Approach (1986), and the teaching activity guide Movement Plus Music (1985). The method

involves providing children with activities in eight specific areas which Weikart refers to as the eight "key experiences in movement". These experiences are:

1. Following movement directions. These activities provide children with practice in tactile, visual, and aural decoding.
2. Describing movement. These activities include talking about movement, planning movements, recalling movements, linking a movement to a word, and linking a series of movements to words in sequence.
3. Moving the body in nonlocomotor ways. Through nonlocomotor movement children have the opportunity to experience body, language, space, and time awareness.
4. Moving the body in locomotor ways. These activities include single movements (walk, run, jump, etc.), variations on single movements, combination movements, and dance steps.
5. Moving with objects (both locomotor and nonlocomotor). This includes carrying, sending, and receiving objects. It also includes the playing of musical instruments.
6. Expressing creativity in movement. These experiences include problem solving, movement exploration, and imagery.

7. Feeling and expressing beat. In these experiences children work on distinguishing between moving to beat and moving to rhythmic patterns of speech or melody.
8. Moving together to a common beat. This includes partner or group movement, group exercise, action songs and singing games, dance, and performing instrumental music.

Weikart describes experiences one and two as the methods for presenting movement activities. Experiences three, four, and five are the content of a good movement program. Experiences six, seven, and eight are the desired outcomes.

### Purpose

The purpose of this study is to measure the effect of instruction using Weikart's sequential approach to rhythmic movement on the rhythmic competency of primary age children. This project seeks to provide objective evidence supporting Weikart's own research in this area. Further, this study seeks to address the following questions:

1. Will instruction based on Weikart's sequential approach make a significant ( $p < .05$ ) difference in the number of children who can demonstrate rhythmic competency?

2. Will gender make a significant ( $p < .05$ ) difference in the number of children who can demonstrate rhythmic competency?
3. Will altering the movement task make a significant ( $p < .05$ ) difference in the number of children who can demonstrate rhythmic competency?

Music educators are well aware of the frustration and failure that the uncoordinated, arrhythmic child experiences in music class. To facilitate the development of musical performance skills, music teachers must be able to assist the child who lacks basic timing. If children who are rhythmically competent experience greater success in musical activities, then it is the duty of music educators to facilitate the development of this skill, and to do so during the crucial early grades. Helping children to "successfully achieve" the basic performance skills of singing, playing, and moving to music, is the responsibility of every teacher seeking to meet the aesthetic goals of music education. The purpose of this study is to assist those teachers in their task.

## CHAPTER II

### REVIEW OF LITERATURE

Elementary music programs frequently emphasize the importance of movement activities as a component of musical learning. The work of Piaget is often cited as the rationale for teaching music through movement in the early grades (Schmitt, 1971). The approaches advocated by Dalcroze, Kodaly, Orff, and Suzuki include movement training as an integral part of their methods (Landis and Carder, 1972). Unfortunately, the development of basic rhythmic competency, the foundation of all rhythmic movement, has not been researched extensively. Even in physical education and dance textbooks, where the need for rhythmic competency is recognized (Murray, 1963; Schurr, 1975), there are few suggestions for dealing with arhythmic students .

#### Studies by Weikart

Weikart's work is unique in its willingness to address the problem of the arhythmic child. In her book, Teaching Movement and Dance: A Sequential Approach (1982, pp. 6-11), she provides statistical information describing the ability of primary age children to demonstrate rhythmic competency. The results of tests given indicate that only 61% of first

graders were able to pat the beat to a piece of recorded music (bilaterally patting the top of the head), and only 34% were able to walk the beat.

In addition, Weikart found that walking the beat was more difficult for boys than for girls. Among first graders, 43% of girls were able to walk the steady beat while only 26% of boys were successful. She goes on to cite gender as a factor in all of her experiments and observations. She states, "The suggestion from the data collected is clear: boys will have more difficulty with rhythmic tasks than girls. Without assistance, one out of three boys will lack basic rhythmic coordination and approximately one out of five girls will lack these skills" (Weikart, 1982, p. 8).

During the course of her studies, Weikart developed a teaching sequence for improving rhythmic competency and tested it on a group of first and second graders. In the pretest, 55% of the students could pat the beat and 22% could walk the beat. In the tests administered after three months of instruction using her sequential approach, every child could pat the beat and 77% of the students could walk the beat. By May every child could accurately perform both tasks.

One question raised by Weikart's research concerns the effect of maturation upon rhythmic competency. Would the test group have improved without special instruction? The

results of Weikart's own comparison of first, second, and third graders (1982, p. 7) indicate that children do improve in their ability to demonstrate rhythmic competency as they get older. For example, she found that 34% of first graders could walk the beat, 37% of second graders could walk the beat, and 51% of third graders could walk the beat. Her testing of upper elementary and adolescent students further supports the importance of maturation. Still, a substantial number of students remain who do not improve with time. She believes that a sequential approach to teaching rhythmic competency can help these students.

In the Romulus Rhythmic Competency Study (Weikart et al., 1987) 358 first graders in the Romulus Michigan School District were tested on their ability to visually and aurally decode movement instructions, and to pat and walk the beat to a piece of recorded music. The experimental group then received instruction in rhythmic movement using Weikart's method. Instruction was provided by the school's music teacher and took place during the first five minutes of each music class. The treatment lasted for one semester. The control group received traditional music instruction from another music teacher, but no special movement training. Posttest results showed significant gains for the experimental group ( $p < .005$ ).

In addition to Weikart's research, a number of other studies exist concerning rhythmic motor development and its



relationship to maturation, training, gender, and task alteration.

#### Effects of Maturation on Rhythmic Performance

In her review of current research in movement training, Delorenzo (1983) found that synchronization of movement to musical rhythm improves primarily through maturation. Similarly, in research with preschool children by Frega (1979) and by Rainbow and Owen (1979), age was the most significant factor. They found training to be far less important than maturation in predicting rhythmic success. Other researchers have also questioned the value of instruction in musical skill development (DeYarmin and Schleuter, 1977; Groves, 1969; Smith, 1982; Wang, 1984).

#### Effects of Training on Rhythmic Performance

Many studies support the viewpoint that training can enhance the development of basic motor skills (Brown, Sherrill and Gench, 1981; Martinek, 1978; Rarick, 1976; Wight, 1937). The connection between training and motor skill improvement was especially strong when the training given was highly specific and involved controlled practice of the desired skill, or of its components.

Burnett (1983) examined the effect of rhythmic movement training upon rhythmic competency, perception, and motor development in developmentally handicapped preschoolers.

She used an adapted form of Weikart's Rhythmic Competency Analysis Test to measure the development of rhythmic competency. Burnett found that training in rhythmic movement could improve not only rhythmic competency, but also perception and motor skill development.

Boyle (1970) showed that rhythmic training improved sight-reading skills, and that tapping the steady beat while playing was an important part of that training. Although Bebeau (1982) disputed his training method, she found that practice was valuable in developing rhythmic reading ability in young children. Other studies supporting the effectiveness of training include Cheek, 1979; Douglas, 1978; Elrod, 1972; Joseph, 1980; Moore, 1984; and Wolff, 1980.

#### Effects of Gender on Rhythmic Performance

Gilbert (1980) supports Weikart's belief that gender is significant to motor skill development. She found that other factors such as race, community size, and past musical experiences were not significant. Schleuter and Schleuter (1984), and Wolff (1980) also concluded that gender affected the motor skill development of primary age children. Conversely, Groves (1969) found that while age and preexisting motor ability were factors in learning to synchronize motor-rhythmic responses, gender was not

significant. Though not unanimous, the preponderance of evidence supports a gender difference.

#### Effects of Task Alteration on Rhythmic Performance

There is strong support for including task alteration as a variable in a study of rhythmic competency. Rainbow and Owen (1979), and Schleuter and Schleuter (1984) found task alteration highly significant to the performance of motor-rhythmic tasks by children, with locomotor movement being far more difficult than non-locomotor movement. Weikart's own studies found that while 61% of first graders could pat the beat to recorded music, only 34% could walk the beat.

#### Effects of Movement Training on Cognitive Skills

In addition to these studies of motor skill development, there has been considerable interest in researching the effects of movement training on cognitive and perceptual learning. Burnett (1983) found that rhythmic training resulted in improvements in perception among handicapped preschoolers. The Romulus Rhythmic Competency Study (Weikart et al., 1987) cited evidence suggesting a connection between movement training and improved academic achievement, though the authors readily admitted that a more tightly designed study would be required to claim a

significant correlation between improvement in rhythmic competency and improvement in achievement test scores.

Generally, research indicates that while training of a very specific nature is valuable, claims that movement instruction can transfer to perceptual or cognitive skills remain highly speculative (Berrol, 1978; Delorenzo, 1983; Toole and Arink, 1982).

#### Effects of Non-Musical Variables on Musical Performance

Several studies were concerned with the effects of non-musical variables on musical achievement. Hedden (1982) attempted to identify measures that would best predict musical achievement in elementary school. He found that general academic achievement was the strongest predictor, though he did not attempt to apply his findings specifically to motor skills.

Ismail (1975) found a positive correlation between intelligence and motor skills in his study of mentally retarded students and normal children of high, middle, and low ability. Wolff (1980) found academic ability to be a factor in musical achievement. Cheek (1979) found that psychomotor training influenced students' rhythmic performance and perception, with her findings most significant for low achieving students.

In a study by Groves (1969) concerning motor-rhythmic responses in primary age children, achievement and general

intelligence were not significant factors. The disagreement among researchers suggests that a correlation between academic ability and rhythmic competency is possible, but not clearly established.

### Affect and Musical Performance

Some researchers have looked at the effect of movement activities upon attitude, self-concept, and behavior (Carlson, 1983; Elrod, 1972). Others have considered the effect of attitude upon achievement (Asmus, 1980). Teachers often cite empirical evidence that movement activities are motivating to students. The effect of movement activities upon attitude and self concept, and the subsequent effect of these factors upon achievement remain unclear, but affect does not appear to be a confounding factor as related to rhythmic competency.

### Methods for Developing Rhythmic Competency

There is a limited amount of research concerning the best methods for rhythmic training. Weikart's approach teaches rhythmic movement through both its spatial and temporal aspects; an approach supported by many writers (Burton, 1977; Gallahue, Werner, and Luedke, 1975; Thomas and Moon, 1976; Winters, 1975). Weikart further maintains that the ability to synchronize body movement to the beat (rhythmic competency) must be taught first, thus providing a

foundation for other motor skills. This premise is supported by Liemohn's (1983) study of developmentally handicapped children. He found that the "rhythmicity" needed to tap the beat to a metronome was highly related to the development of subsequent motor skills. Boyle (1970) found tapping the beat to be very effective in improving rhythmic performance skills in instrumentalists.

Weikart's method includes a hierarchy of rhythmic activities consisting of saying the beat (language), then tapping the beat (small muscle movement), and finally walking the beat (large muscle movement). Both physical education and music literature support this basic approach. Thomas and Moon (1976) found that the use of verbal cues was the most effective way to improve performance of rhythmic movements. Rainbow and Owen (1979), in their study with three-year-olds, found that tasks involving speech rhythms were the least difficult to perform, nonlocomotor skills were second, and locomotor or combined movements were extremely difficult. Schleuter and Schleuter (1984) also supported this premise in their research with primary age children. The results indicated verbalizing a rhythmic response was easiest, followed by small muscle responses, and then large muscle responses.

### Summary

The studies cited suggest a number of conclusions.

(1) The ability to synchronize movement to an external pulse (rhythmic competency) is a prerequisite to success in many music, sport, and dance activities. (2) Rhythmic competency is lacking in many elementary music students. (3) Gender and task alteration appear to be factors in developing rhythmic competency, while race, academic achievement, past musical experiences, and attitude probably have little effect. (4) While maturation is important, training can be effective in improving rhythmic skills. (5) Weikart's eight key experiences in movement provide a logical and efficient method for helping children to develop rhythmic competency, and appear to be consistent with related research.

### CHAPTER III

#### METHODOLOGY

The purpose of this study was to measure the effect of Weikart's sequential approach to rhythmic movement on the ability of first graders to move to a steady beat. Isolated variables included gender and task alterations. The following hypotheses, stated in null form, were tested:

1. There will be no significant ( $p=.05$ ) difference in the ability of students to demonstrate rhythmic competency as a result of instruction using Weikart's sequential approach to rhythmic movement.
2. There will be no significant difference ( $p=.05$ ) in the ability of students to demonstrate rhythmic competency as a result of gender.
3. There will be no significant ( $p=.05$ ) difference in the ability of students to demonstrate rhythmic competency as a result of task alteration.
4. There will be no significant ( $p=.05$ ) interaction between gender, task alteration, and instruction.



Results of Weikart's Rhythmic Competency Analysis Test were analyzed to determine the effect of these variables upon the ability of first graders to move to a steady beat.

### Design and Analysis

This study utilized a quasi-experimental nonequivalent control group design (Campbell and Stanley, 1966). Two groups of subjects were randomly selected from among the first graders at each of two elementary schools. The students from one school were designated as the control group and the students from the other school were designated as the experimental group. Pretests were given to both groups using Weikart's Rhythmic Competency Analysis Test (RCAT). The independent variable consisted of approximately 25 five-minute training sessions using Weikart's "eight key experiences" in rhythmic movement. Lesson plans were taken directly from Music Plus Movement (Weikart, 1985). The training sessions were incorporated into the regular music class. The control group received no special training in rhythmic movement, but continued to participate in music. Following the treatment period, posttests using the RCAT were given to all subjects.

An attempt to control for history and maturation was made through random selection of subjects from among the first graders at each school. In addition, the likelihood that the experiences and the developmental rates of the

first grade students in both groups would be similar was strengthened by the fact the participating schools had many common traits. They were located in the same area of the city. They used the same teaching curricula. Both schools had above average composite scores on the most recent Iowa Test of Basic Skills (Bolten, 1987), and both had similar minority enrollments (Des Moines Public Schools, 1986). As stated above, studies by Gilbert (1980) and Groves (1969) suggest that past experiences, socioeconomic status, general intelligence, and race are not confounding variables in measuring motor skill development.

Mortality is an inevitable threat to any field study, but in this case was adequately controlled by several factors. The project was fortunate to have the support and cooperation of the staff members at both participating schools. The testing procedure was very simple and non-threatening, and all testing was done during the school day. Disruption of the student's regular schedule was minimal.

Seven students initially selected for the control group declined to participate and were replaced. None of the subjects asked to leave the study after it had begun. Three students from the experimental group and three from the control group moved away during the treatment period for a mortality rate of 10%. Their scores were not included in the final results.

Prior to analyzing the data, Pearson correlation coefficients were computed to measure interjudge reliability for the RCAT. The analysis then began with the computation of mean scores for each of the six tasks on the RCAT and for the total score. Cell means were determined for males, females, subjects receiving instruction, and subjects receiving no instruction. Frequency and percentage of subjects achieving rhythmic competency (a score of 3.0) were also computed for each task.

Using t tests, comparisons were made between pretest scores and posttest scores to determine the significance of the improvement made by the 54 subjects. Comparisons were also made between scores for locomotor and nonlocomotor tasks at both the pretest and posttest level in order to measure differences due to task alteration. A .05 level of significance was required to reject the null hypothesis.

A pretest-posttest design was then employed to assess possible differences in RCAT scores resulting from either gender or instruction. RCAT data was treated statistically with a 2(gender) x 2(instruction) factorial analysis of variance (ANOVA) and multiple analysis of variance (MANOVA). F values were computed to determine main and interaction effects. Again, a .05 level of significance was required to reject the null hypotheses.

### Measurement Instrument

Weikart's Rhythmic Competency Analysis Test (RCAT) was selected to measure the ability of the subjects in this study to demonstrate rhythmic competency. The RCAT was developed by Weikart and the High/Scope Educational Research Foundation to assess the performance of individuals in synchronizing locomotor and nonlocomotor movements to the underlying beat in a piece of recorded music. It was originally used to predict the ability of students to participate successfully in folk dance activities and showed excellent predictive validity (Weikart, 1982).

Weikart has used the test with hundreds of children, adolescents, and adults during the process of developing a method for improving rhythmic coordination. Burnett expanded the use of the RCAT to include physically handicapped children and found it to have excellent internal and external validity.

Currently, Weikart is using the RCAT in working with elementary teachers around the country to gather data correlating improvement in RCAT scores with increased achievement in reading. The RCAT was recently expanded to include a larger number of movement tasks. This expanded version was used as the test instrument for this study.

The reliability of the RCAT was a subject of concern due to its dependence on subjective observations by the judges. In a 1984 study Weikart reported an alpha

coefficient of internal consistency of  $r=.79$  for the RCAT (Weikart et al., 1987). Despite some reservations, the RCAT was selected because a simple instrument was required to meet the special needs of the study.

Permission from the school district and from the parents of the subjects was predicated upon a promise to cause as little disruption to the learning environment as possible. The administration of the RCAT did not require the subjects to leave their classes for more than ten or fifteen minutes, and could be accomplished without special equipment. In addition, only one two-hour session was needed to train the judges, and the amount of time required to score the tests was minimal.

The Rhythmic Competency Analysis Test consisted of twelve tasks requiring the subjects to synchronize six basic movements to the underlying steady beat in two pieces of recorded music. The judges led the subjects through a series of introductory exercises to insure that they understood the tasks. Following this introduction, the subjects were asked to do the following:

1. Pat the legs with both hands together (bilaterally) to the underlying beat of the first musical selection (approximately ♩ =132).
2. Pat the legs, alternating hands, to the underlying beat of the same music.
3. Walk the beat while seated to the same music.

4. Walk the beat while standing in place to the same music.
5. Walk forward to the beat of the same music.
6. Walk backward to the beat of the same music.
7. Repeat task #1 using the second musical selection (approximately ♩ =120).
8. Repeat task #2.
9. Repeat task #3.
10. Repeat task #4.
11. Repeat task #5.
12. Repeat task #6.

Each subject was instructed to listen for the steady beat in the music and to begin the movement task when they felt ready. Scoring began with the first movement by the subject and ended when at least sixteen beats had elapsed.

Each subject's performance was observed by two independent judges who applied the scoring criteria for each of the twelve tasks and recorded the result on a standard form. A copy of the test form can be found in Appendix A. Scoring resulted in interval level data for each item on a scale of one to three. The following objective criteria was used:

- 3 = all 16 consecutive movements in synchronization with the beat of the music.

2 = some, but not all movements in synchronization with the beat of the music.

1 = no movements in synchronization with the beat of the music.

It should be noted that while a wider scale for scoring the test would have provided stronger data, attempts by the judges to make more precise determinations of beat synchronization (i.e. counting the exact number of correct movements) were found to be highly unreliable.

The selection of music for use in the RCAT was critical. Initial selection of music was made by the researcher from recordings produced by Weikart (1983-1985). Music was selected that had a clear steady beat, was instrumental rather than vocal, did not have a strong ostinato or melodic rhythm, did not have a distracting timbre, style, meter or phrase structure, was not highly syncopated, was of sufficient length, and had no variation of tempo.

Two musical selections of different tempos (approximately ♩ =132 and ♩ =120) were used during the test. The basic tempo range of 120 to 132 was used because it represented a comfortable tempo for children (Walters, 1983), and fell within the common practice in folk dance music (Weikart, 1982). Two selections at different tempos were used to insure that the subjects were able to attend to

the beat of the music in a variety of situations, and to control for personal tempo.

Once the initial selection was made, a final decision on the appropriateness of the music was made by a panel of elementary music teachers ( $N=5$ ). The final selections for the pretest were "Romanian Hora" ( $\text{♩}=137$ ) from Rhythmically Moving 7, and "Bechatzar Harabbi" ( $\text{♩}=121$ ) from Rhythmically Moving 6. The selections used for the posttest were "Blackberry Quadrille" ( $\text{♩}=131$ ) from Rhythmically Moving 1, and "Debka Kundit" ( $\text{♩}=118$ ) from Rhythmically Moving 7 (Weikart, 1983-1985).

The musical selections were recorded on Ampex #615 cassette tape using a Technics turntable (SL-15), Technics preamplifier (ST-K808), Carver amplifier (M-200t), and a Eumig stereo three head cassette deck (FL-1000up). Initial tempo screening was done with an Electro-Mat Mark 3 Metrognome. Final tempo screening was done with a UREI Model 964 digital metronome. Taped selections were played on a Marantz PMD340 Professional Stereo Cassette Player. A complete copy of the RCAT can be found in Appendix A.

### Subjects

Sixty first graders from two elementary schools in Des Moines, Iowa served as subjects. Fifteen boys and fifteen girls were selected randomly from among the first graders at each school. The students from School A served as the



experimental group and the students from School B served as the control group. Permission to perform the project was secured from the Des Moines Public School's Assistant Superintendent for Instruction, along with the cooperation of the teachers and administrators involved. The parents of each subject were notified in writing (see Appendix B). All participation was voluntary.

### Procedure

Two music education students from Drake University were trained by the researcher to act as judges. A pilot test using a small number of second grade students was administered by the researcher, the two judges, and a university advisor to assure interjudge reliability.

Pretests were administered individually to the subjects from both the control and experimental groups between October 9 and November 11 of 1986. Testing took place during the regular school day in an empty classroom. Identical verbal instructions, as stated in the RCAT, were given to each student.

The treatment period lasted from November 13, 1986 to February 28, 1987. Two approaches to providing the treatment activities were considered. The teaching guide suggested that the rhythmic movement activities be taught on a daily basis by classroom teachers, while in the Romulus Rhythmic Competency Study the activities were presented

twice weekly by the school's music specialist. The latter approach was selected for a number of reasons.

While daily instruction would provide an ideal learning situation, implementing a rhythmic movement program into the regular primary classrooms was not feasible. None of the classroom teachers had any expertise in teaching rhythmic movement, nor were they familiar with Weikart's method. The music specialist had received special training in Weikart's method and was strongly committed to promoting rhythmic competency. Having a single instructor for the treatment period also protected against threats to the internal validity of the study.

During the treatment period, both groups received music instruction using Silver Burdett's Music textbook series (Crook, Reimer, and Walker, 1981). Activities included singing, listening, playing instruments, and learning to read and write musical notation. Subjects in the control group received sixty minutes of music instruction each week. They were taught by the music specialist at School B. Subjects in the experimental group received an average of 50 minutes of music instruction per week. Five to ten minutes of that time was used for rhythmic movement activities. The researcher was the instructor for the experimental group.

Because the 30 subjects in the experimental group were selected from five different classes, it was impossible to make the treatment identical for each subject. Normal

interruptions in the school day and absenteeism caused some students to receive more instructional time than others. All subjects received a minimum of 20 instructional periods.

Instruction included activities from key experiences one through five, and experiences seven and eight. Step six, expressing creativity in movement, was not a primary consideration. The only equipment required was a tape recorder and record albums I through IV from the series Rhythmically Moving (Weikart, 1983-1985). The lessons took little time to prepare and student response to the activities was positive.

The RCAT was administered again between March 1 and April 20 of 1987. The procedure was identical except that new musical selections were used.

#### Timeline of Study

The schedule followed in implementing the study is summarized in the following timeline:

July 1, 1986	Request to perform research submitted to Des Moines Independent Community School District.
October 2, 1986	Approval for research project received.
October 6, 1986	Letters sent to parents of all subjects.
October 8, 1986	Pilot testing performed.
October 9, 1986	Pretesting initiated.

November 11, 1986	Pretesting completed.
November 13, 1986	Treatment initiated.
February 20, 1987	Formal proposal for field report submitted.
February 28, 1987	Treatment completed.
March 1, 1987	Posttesting initiated.
April 20, 1987	Posttesting completed.
May, 1987	Analysis of data.
July 1, 1987	Final draft submitted.

## CHAPTER IV

### RESULTS

The purpose of this study was to determine the effect of instruction using Weikart's sequential approach to rhythmic movement on the ability of first graders to demonstrate rhythmic competency. Rhythmic competency was defined as the ability to synchronize a movement task to the underlying steady beat in a piece of recorded music. An effort was made to assess the impact of gender and task alteration upon the ability to demonstrate rhythmic competency.

Sixty first graders were randomly selected from two Des Moines elementary schools to serve as subjects. The experimental group ( $n=30$ ) received rhythmic movement training using Weikart's approach. The control group ( $n=30$ ) received no special training in rhythmic movement. There was a mortality rate of 10%. A pretest-posttest design was used to determine any possible differences in rhythmic competency due to instruction.

The measurement instrument was Weikart's Rhythmic Competency Analysis Test (RCAT). The RCAT was administered by two trained observers who independently scored each task. The test required each subject to synchronize six different

movement tasks to the underlying beat in a piece of recorded music. Each task was performed twice, using two musical selections of different tempos. Correlation coefficients were computed to measure interjudge reliability.

An analysis of variance (ANOVA) was administered to RCAT data to determine any differences in performance between males ( $n=26$ ) and females ( $n=28$ ), and between the experimental group ( $n=27$ ) and the control group ( $n=27$ ). Comparison of mean scores for nonlocomotor and locomotor movement tasks was accomplished through administration of  $t$  tests. A multiple analysis of variance (MANOVA) was administered to measure differences between the gains made by the control group and gains made by the experimental group.

Results of the analysis of data have been organized into the following eight sections:

- I. Tests of interjudge reliability.
- II. Mean scores from the Rhythmic Competency Analysis Test.
- III. Frequency and percentage of subjects demonstrating rhythmic competency.
- IV. Effects of task alteration.
- V. Results of the analysis of variance of pretest scores.
- VI. Results of the analysis of variance of posttest scores.

VII. Effects of treatment.

VIII. Summary.

#### Tests of Interjudge Reliability

Pearson correlation coefficients were computed to measure interjudge reliability for the RCAT. Interjudge reliability was found to be high for both the pretest,  $r=.95$ ,  $p<.001$ ; and the posttest,  $r=.94$ ,  $p<.001$ .

#### Mean Scores from the Rhythmic Competency Analysis Test

Mean scores were computed for all subjects ( $N=54$ ) for each of the six tasks on the RCAT (patting bilaterally, patting alternating, walking seated, walking in place, walking forward, and walking backward). A mean score for all six tasks was also determined. Because there was a high correlation between the scores assigned by the two judges, the mean scores for each task were determined by averaging the scores of both judges. In addition, the mean scores for each task represented an average of the two attempts by each subject to perform the task, the first time at  $\downarrow=132$  and the second time at  $\downarrow=120$ . Scores ranged from 1.0 to 3.0, with 3.0 being a perfect score.

Pretest mean scores for each task are presented in Table 1. For Task 1 (patting bilaterally) the mean score for all subjects was  $M=2.23(SD=.66)$ . Task 2 (patting alternating) produced a mean score of  $M=2.12(SD=.63)$ . The

scores for Task 3 (walking seated) resulted in a mean score of  $\bar{M}=2.19(\underline{SD}=.56)$ . For Task 4 (walking in place) the mean score was  $\bar{M}=2.19(\underline{SD}=.65)$ . Scoring for Task 5 (walking forward) produced a mean score of  $\bar{M}=1.86(\underline{SD}=.60)$ , and scoring for Task 6 (walking backward) produced a mean score of  $\bar{M}=1.81(\underline{SD}=.60)$ . The mean score resulting from All Tasks Combined was  $\bar{M}=2.07(\underline{SD}=.52)$ .

Posttest data for each task are presented in Table 2. For Task 1 the mean score for all subjects was  $\bar{M}=2.64(\underline{SD}=.44)$ , while Task 2 produced a mean score of  $\bar{M}=2.50(\underline{SD}=.51)$ . The scores for Task 3 resulted in a mean score of  $\bar{M}=2.45(\underline{SD}=.52)$ . For Task 4 the mean score was  $\bar{M}=2.61(\underline{SD}=.50)$ . Scoring for Task 5 produced a mean score of  $\bar{M}=2.43(\underline{SD}=.55)$ , and scoring for Task 6 produced a mean score of  $\bar{M}=2.40(\underline{SD}=.61)$ . The mean score resulting from All Tasks Combined was  $\bar{M}=2.51(\underline{SD}=.44)$ .

The scores of male subjects, female subjects, subjects receiving instruction (experimental), and subjects receiving no instruction (control), were examined separately. Cells means were computed for each of the four groups for both the pretest and posttest.

Pretest data for male subjects ( $n=26$ ) produced a mean score of  $\bar{M}=2.16(\underline{SD}=.64)$  for Task 1 and  $\bar{M}=1.95(\underline{SD}=.56)$  for Task 2. Results for Task 3 were  $\bar{M}=2.11(\underline{SD}=.57)$ . For Task 4 the mean score was  $\bar{M}=2.05(\underline{SD}=.53)$ . Scoring for Task 5 produced a mean score of  $\bar{M}=1.78(\underline{SD}=.53)$ , and scoring for



Table 1

Pretest Mean Scores from the Rhythmic CompetencyAnalysis Test

Task	Exp. ( <i>n</i> =27)		Control ( <i>n</i> =27)		All ( <i>N</i> =54)		Males ( <i>n</i> =26)		Females ( <i>n</i> =28)	
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>
1 Patting Bilaterally	2.25	.62	2.20	.71	2.23	.66	2.16	.64	2.29	.69
2 Patting Alternating	2.00	.56	2.23	.69	2.12	.63	1.95	.56	2.27	.66
3 Walking Seated	2.15	.54	2.24	.60	2.19	.56	2.11	.57	2.28	.56
4 Walking in Place	2.11	.64	2.28	.67	2.19	.65	2.05	.53	2.33	.73
5 Walking Forward	1.65	.48	2.07	.62	1.86	.60	1.78	.53	1.94	.64
6 Walking Backward	1.65	.54	1.96	.61	1.81	.52	1.65	.47	1.95	.67
All Tasks Combined	1.97	.45	2.17	.57	2.07	.52	1.95	.43	2.17	.58

Table 2

Posttest Mean Scores from the Rhythmic CompetencyAnalysis Test

Task	Exp. ( <i>n</i> =27)		Control ( <i>n</i> =27)		All ( <i>N</i> =54)		Males ( <i>n</i> =26)		Females ( <i>n</i> =28)	
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>
1 Patting Bilaterally	2.58	.45	2.69	.42	2.64	.44	2.50	.51	2.77	.30
2 Patting Alternating	2.42	.50	2.58	.51	2.50	.51	2.39	.54	2.60	.47
3 Walking Seated	2.43	.53	2.48	.53	2.45	.52	2.40	.60	2.50	.46
4 Walking in Place	2.60	.52	2.61	.49	2.61	.50	2.47	.56	2.73	.41
5 Walking Forward	2.45	.45	2.41	.64	2.43	.55	2.38	.62	2.47	.48
6 Walking Backward	2.42	.50	2.38	.70	2.40	.61	2.31	.63	2.48	.58
All Tasks Combined	2.48	.41	2.53	.47	2.51	.44	2.41	.50	2.59	.36

Task 6 produced a mean score of  $\bar{M}=1.65(\underline{SD}=.47)$ . The mean score resulting from All Tasks Combined was  $\bar{M}=1.95(\underline{SD}=.43)$ .

Posttest data for male subjects produced a mean score of  $\bar{M}=2.50(\underline{SD}=.51)$  for Task 1 and  $\bar{M}=2.39(\underline{SD}=.54)$  for Task 2. Results for Task 3 were  $\bar{M}=2.40(\underline{SD}=.60)$ . For Task 4 the mean score was  $\bar{M}=2.47(\underline{SD}=.56)$ . Scoring for Task 5 produced a mean score of  $\bar{M}=2.38(\underline{SD}=.62)$ , and scoring for Task 6 produced a mean score of  $\bar{M}=2.31(\underline{SD}=.63)$ . The mean score resulting from All Tasks Combined was  $\bar{M}=2.41(\underline{SD}=.50)$ .

Analysis of pretest data for female subjects ( $n=28$ ) resulted in mean scores of  $\bar{M}=2.29(\underline{SD}=.69)$  for Task 1 and  $\bar{M}=2.27(\underline{SD}=.66)$  for Task 2 and  $\bar{M}=2.28(\underline{SD}=.56)$  for Task 2. For Task 4 the mean score was  $\bar{M}=2.33(\underline{SD}=.73)$ . Scoring for Task 5 produced a mean score of  $\bar{M}=1.94(\underline{SD}=.64)$ , and scoring for Task 6 produced a mean score of  $\bar{M}=1.95(\underline{SD}=.67)$ . The mean score resulting from All Tasks Combined was  $\bar{M}=2.17(\underline{SD}=.58)$ .

The analysis of posttest data for females produced mean scores of  $\bar{M}=2.77(\underline{SD}=.30)$  for Task 1 and  $\bar{M}=2.60(\underline{SD}=.47)$  for Task 2. The mean score for Task 3 was  $\bar{M}=2.50(\underline{SD}=.46)$ . Task 4 showed a mean score of  $\bar{M}=2.73(\underline{SD}=.41)$  and Task 5 produced a mean score of  $\bar{M}=2.47(\underline{SD}=.48)$ . For Task 6 the mean score was  $\bar{M}=2.48(\underline{SD}=.58)$ . For All Tasks Combined it was  $\bar{M}=2.59(\underline{SD}=.36)$ .

Examination of pretest data for the experimental group ( $n=27$ ) produced a mean score of  $\bar{M}=2.25(\underline{SD}=.62)$  for Task 1,

$\bar{M}=2.00$  ( $\underline{SD}=.56$ ) for Task 2 and  $\bar{M}=2.15$  ( $\underline{SD}=.54$ ) for Task 3. For Task 4 the mean score was  $\bar{M}=2.11$  ( $\underline{SD}=.64$ ). Scoring for Task 5 produced a mean score of  $\bar{M}=1.65$  ( $\underline{SD}=.48$ ). Scoring for Task 6 produced a mean score of  $\bar{M}=1.65$  ( $\underline{SD}=.54$ ). For All Tasks Combined the mean score was  $\bar{M}=1.97$  ( $\underline{SD}=.45$ ).

Posttest data for the experimental group produced mean scores of  $\bar{M}=2.58$  ( $\underline{SD}=.45$ ) for Task 1,  $\bar{M}=2.42$  ( $\underline{SD}=.50$ ) for Task 2,  $\bar{M}=2.43$  ( $\underline{SD}=.53$ ) for Task 3, and  $\bar{M}=2.60$  ( $\underline{SD}=.52$ ) for Task 4. Scoring for Tasks 5 and 6 produced mean scores of  $\bar{M}=2.45$  ( $\underline{SD}=.45$ ) and  $\bar{M}=2.42$  ( $\underline{SD}=.50$ ). Results for All Tasks Combined produced a mean score of  $\bar{M}=2.48$  ( $\underline{SD}=.41$ ).

Mean scores based on pretest data for the control group ( $n=27$ ) were  $\bar{M}=2.20$  ( $\underline{SD}=.71$ ) for Task 1,  $\bar{M}=2.23$  ( $\underline{SD}=.69$ ) for Task 2,  $\bar{M}=2.24$  ( $\underline{SD}=.60$ ) for Task 3,  $\bar{M}=2.28$  ( $\underline{SD}=.67$ ) for Task 4,  $\bar{M}=2.07$  ( $\underline{SD}=.62$ ) for Task 5, and  $\bar{M}=1.96$  ( $\underline{SD}=.61$ ) for Task 6. For All Tasks Combined the mean score was  $\bar{M}=2.17$  ( $\underline{SD}=.57$ ).

Mean scores based on posttest data for the control group were  $\bar{M}=2.69$  ( $\underline{SD}=.42$ ) for Task 1,  $\bar{M}=2.58$  ( $\underline{SD}=.51$ ) for Task 2,  $\bar{M}=2.48$  ( $\underline{SD}=.53$ ) for Task 3,  $\bar{M}=2.61$  ( $\underline{SD}=.49$ ) for Task 4,  $\bar{M}=2.41$  ( $\underline{SD}=.64$ ) for Task 5, and  $\bar{M}=2.38$  ( $\underline{SD}=.70$ ) for Task 6. The mean score for All Tasks Combined was  $\bar{M}=2.53$  ( $\underline{SD}=.47$ ).

### Frequency and Percentage of Subjects Demonstrating Rhythmic Competency

The percentage of subjects able to demonstrate rhythmic competency was computed for each task in both the pretest and posttest (see Table 3). Rhythmic competency was defined in this study as the ability to synchronize the desired body movement task to at least 16 consecutive beats of recorded music. Subjects had to receive a score of 3.0 for both tempo levels ( $\downarrow$ =132 and  $\downarrow$ =120) from both judges in order to be considered rhythmically competent.

Results of the pretest revealed that 18.5% of the subjects were competent at Task 1, 14.8% were competent at Task 2, 18.5% were competent at Task 3, and 20.4% were competent at Task 4. A noticeable drop in the percentage of subjects who were rhythmically competent occurred for Tasks 5 and 6. Five of the 54 subjects (9.3%) were able to perform Task 5 (walking forward to the beat of the music) perfectly, and two of the subjects (3.7%) were rhythmically competent at Task 6 (walking backward to the beat of the music). Only one subject (1.9%) could perform all of the tasks on the pretest.

Posttest results showed an improvement in rhythmic competency with 26% of the subjects competent at Task 1, 35.2% at Task 2, 29.6% at Task 3, and 50% at Task 4. Unlike the pretest, posttest data revealed a less dramatic difference in frequency and percentage for Tasks 5 and 6.

Table 3

Frequency and Percentage of Subjects Demonstrating Rhythmic Competency

Task	Pretest		Posttest	
	Frequency	%	Frequency	%
1 Patting Bilaterally	10	18.5	26	48.1
2 Patting Alternating	8	14.8	19	35.2
3 Walking Seated	10	18.5	16	29.6
4 Walking in Place	11	20.4	27	50.0
5 Walking Forward	5	9.3	17	31.5
6 Walking Backward	2	3.7	37	37.0
All Tasks Combined	1	1.9	5	9.3

Table 4

Results of *t* Tests for Nonlocomotor and Locomotor Tasks

Variable	Mean Difference	<i>t</i> Value	<i>df</i>	2-Tail Probability
Pretest - Nonlocomotor (Tasks 1-4)	.3495	6.09	53	.000
Pretest - Locomotor (Tasks 5-6)				
Posttest - Nonlocomotor	.1354	2.74	53	.008
Posttest - Locomotor				
Pretest - Nonlocomotor	.3669	5.64	53	.000
Posttest - Nonlocomotor				
Pretest - Locomotor	.5810	8.38	53	.000
Posttest - Locomotor				

Seventeen subjects (31.5%) were able to walk forward to the beat (Task 5) and 37 subjects (37%) were able to walk backward to the beat (Task 6). Five subjects (9.3%) were competent at all tasks on the posttest.

#### Effects of Task Alteration

In order to compare the mean scores for nonlocomotor movements (Tasks 1 - 4) with the mean scores for locomotor movements (Tasks 5 - 6),  $t$  tests were administered. Significant differences ( $p < .05$ ) were found at both the pretest and posttest level (see Table 4).

A comparison of pretest means for nonlocomotor and locomotor tasks found locomotor tasks to be significantly more difficult than nonlocomotor tasks,  $t = 6.09$ ,  $p < .001$ . Posttest means also yielded significant differences between nonlocomotor and locomotor task performance,  $t = 2.74$ ,  $p < .01$ .

A comparison of pretest means for nonlocomotor tasks with posttest means for the same tasks revealed a significant improvement in scores,  $t = 5.64$ ,  $p < .001$ . A comparison between pretest means for locomotor tasks with posttest means for the same tasks also revealed a significant improvement in performance,  $t = 8.38$ ,  $p < .001$ .

#### Results of the Analysis of Variance of Pretest Scores

An ANOVA was administered to the pretest data to examine differences based on either gender or treatment for

each of the six tasks on the RCAT.  $F$  values and levels of significance were computed for each of the main effects and for interaction between the variables (see Table 5).

For Task 1 there were no significant differences in mean scores on either the basis of gender,  $F(1,50)=.45$ , n.s., or on the basis of treatment,  $F(1,50)=.65$ , n.s. For Task 2 there were also no significant differences in mean scores on either the basis of gender,  $F(1,50)=3.54$ , n.s., or on the basis of treatment,  $F(1,50)=1.91$ , n.s. There were no significant differences in mean scores on either the basis of gender,  $F(1,50)=1.21$ , n.s., or on the basis of treatment,  $F(1,50)=.35$ , n.s., for Task 3. Further, there were no significant differences in mean scores on either the basis of gender,  $F(1,50)=2.58$ , n.s., or on the basis of treatment,  $F(1,50)=.90$ , n.s., for Task 4.

For Task 5 there were no significant differences in mean scores on the basis of gender,  $F(1,50)=1.08$ , n.s. However, there was a significant difference between the mean score of the experimental group and the mean score of the control group; the control group performing significantly better at walking forward than the experimental group,  $F(1,50)=7.81$ ,  $p<.01$ . There was no significant interaction between variables,  $F(1,50)=.39$ , n.s.

For Task 6 there were no significant differences in mean scores on the basis of gender,  $F(1,50)=3.52$ , n.s. However, there was a significant difference between the mean

Table 5

Results of the Analysis of Variance of Pretest Scores

Task	Source of Variation	Sum of Squares	df	Mean Square	F	Significance of F
1	Gender	.201	1	.021	.453951	.504
	Treatment	.029	1	.029	.651899	.800
2	Gender	1.346	1	1.346	3.545401	.066
	Treatment	.723	1	.723	1.905904	.174
3	Gender	.394	1	.394	1.207757	.227
	Treatment	.116	1	.116	.354530	.554
4	Gender	1.074	1	1.074	2.580783	.114
	Treatment	.375	1	.375	.900916	.347
5	Gender	.339	1	.339	1.082638	.303
	Treatment	2.449	1	2.449	7.813511	.007
6	Gender	1.154	1	1.154	3.517402	.067
	Treatment	1.338	1	1.338	4.077857	.049
All Tasks Combined	Gender	.675	1	.675	2.581864	.114
	Treatment	.527	1	.527	2.014333	.162

Table 6

Results of the Analysis of Variance of Posttest Scores

Task	Source of Variation	Sum of Squares	df	Mean Square	F	Significance of F
1	Gender	.967	1	.967	5.404195	.024
	Treatment	.167	1	.167	.931184	.339
2	Gender	.561	1	.561	2.199526	.144
	Treatment	.375	1	.375	1.470390	.231
3	Gender	.125	1	.125	.446493	.507
	Treatment	.042	1	.042	.149256	.701
4	Gender	.918	1	.918	3.692045	.060
	Treatment	.001	1	.001	.465341	.946
5	Gender	.106	1	.106	.338102	.564
	Treatment	.029	1	.029	.924443	.762
6	Gender	.410	1	.410	1.079065	.304
	Treatment	.019	1	.019	.487048	.826
All Tasks Combined	Gender	.447	1	.447	2.309475	.135
	Treatment	.025	1	.025	.130349	.720



score of the experimental group and the mean score of the control group; the control group performing significantly better at walking backward than the experimental group,  $F(1,50)=4.08$ ,  $p<.05$ . There was no significant interaction between variables,  $F(1,50)=.19$ , n.s.

An ANOVA was also made for the mean scores computed by adding together all of the tasks on the RCAT. There were no significant differences between males and females for all RCAT tasks,  $F(1,50)=2.58$ , n.s. Further, there were no significant differences between the control group and the experimental group for all RCAT tasks,  $F(1,50)=2.01$ , n.s.

#### Results of the Analysis of Variance of Posttest Scores

An ANOVA was administered to the posttest data to examine differences based on either gender or treatment for each of the six tasks on the RCAT.  $F$  values and levels of significance were computed for each of the main effects and for interaction between the variables (see Table 6).

Females performed significantly better on Task 1,  $F(1,50)=5.40$ ,  $p<.05$ , but there were no significant differences between the experimental and control groups,  $F(1,50)=.93$ , n.s. Further, there was no significant interaction between variables,  $F(1,50)=.13$ , n.s.

For Task 2 there were no significant differences either on the basis of gender,  $F(1,50)=2.20$ , n.s., or of treatment,  $F(1,50)=1.47$ , n.s. There were no significant differences on

either the basis of gender,  $F(1,50)=.45$ , n.s., or of treatment,  $F(1,50)=.15$ , n.s., for Task 3. For Task 4 there were no significant differences on either the basis of gender,  $F(1,50)=3.70$ , n.s., or of treatment,  $F(1,50)=.47$ , n.s. There were also no significant differences on either the basis of gender,  $F(1,50)=.34$ , n.s., or of treatment,  $F(1,50)=.92$ , n.s., for Task 5. Similarly, there were no significant differences for Task 6 on the basis of gender,  $F(1,50)=1.08$ , n.s., or of treatment,  $F(1,50)=.49$ , n.s. For all tasks there were no significant differences on either the basis of gender,  $F(1,50)=2.31$ , n.s., or of treatment,  $F(1,50)=.13$ , n.s.

#### Effects of Treatment

A MANOVA was administered to determine significant differences between the gains made on the RCAT scores by the experimental group and the gains made by the control group. Results were computed for each of the six RCAT tasks and for the total RCAT score (see Table 7).

For Task 1 there were no significant differences,  $F(1,52)=.67$ , n.s. For Task 2 there were also no significant differences,  $F(1,52)=.14$ , n.s. Further, there were no significant differences for Task 3,  $F(1,52)=.05$ , n.s., or for Task 4,  $F(1,52)=1.22$ , n.s.

Table 7

Results of the Multiple Analysis of Variance of Experimental  
and Control Group Scores

Task	Sum of Squares	<i>df</i>	Mean Square	<i>F</i>	Significance of <i>F</i>
1	.16725	1	.16725	.66744	.418
2	.02836	1	.02836	.13696	.713
3	.00926	1	.00926	.04591	.831
4	.16725	1	.16725	1.21546	.275
5	1.50521	1	1.50521	9.32258	.004
6	.83565	1	.83565	5.74946	.020
All Tasks Combined	.16075	1	.16075	1.89399	.175

Results showed significant differences for Task 5 and for Task 6. The experimental group made significantly more improvement than the control group at performing Task 5 (walking forward),  $F(1,52)=9.32$ ,  $p<.01$ . They also demonstrated significantly greater improvement in performing Task 6 (walking backward),  $F(1,52)=5.75$ ,  $p<.05$ .

### Summary

The analysis of data revealed several important points:

1. The scoring method for the RCAT proved to be highly reliable for both the pretest ( $r=.95$ ,  $p<.001$ ) and the posttest ( $r=.94$ ,  $p<.001$ ).

2. The percentage of students able to demonstrate rhythmic competency was small. Only 1.9% were competent at all tasks on the pretest, and only 9.3% were competent at all tasks on the posttest.

3. Locomotor tasks were significantly more difficult than nonlocomotor tasks at both the pretest and posttest level ( $p<.05$ ).

4. The subjects ( $N=54$ ) made significant improvement in both nonlocomotor and locomotor tasks during the treatment period ( $p<.05$ ).

5. Although the control group consistently scored better on the RCAT than the experimental group, there were no significant differences between the pretest scores of the two groups for Tasks 1 through 4 ( $p>.05$ ).

6. The control group scored significantly better than the experimental group on Task 5 (walking forward) and Task 6 (walking backward) in the pretest ( $p < .05$ ).

7. Although the control group continued to score better on the RCAT than the experimental group, there were no significant differences between the experimental and control groups on any of the tasks in the posttest ( $p > .05$ ).

8. Gender was a significant factor only for Task 1. On the posttest, females scored significantly higher than males on patting bilaterally ( $p < .05$ ).

9. The experimental group made significantly more improvement on performing Task 5 and Task 6 from the RCAT than the control group ( $p < .05$ ).

A complete discussion of all of these points can be found in Chapter V.

## CHAPTER V

### SUMMARY AND DISCUSSION

The purpose of this study was to examine the ability of primary age children to demonstrate rhythmic competency. A comparison was made between children receiving special instruction in rhythmic movement and those receiving no special instruction. Other variables were gender and task alteration.

The method of instruction used in the study was Weikart's Sequential Approach to Rhythmic Movement (Weikart, 1982). The test instrument was the Rhythmic Competency Analysis Test (RCAT). During the test each subject was asked to perform six movement tasks in synchronization with the underlying beat in a piece of recorded music for at least 16 beats. The tasks were: (1) patting the legs with both hands together (bilaterally), (2) patting the legs with hands alternating, (3) walking the feet while seated, (4) walking while standing in place, (5) walking forward, and (6) walking backward. Every task was performed twice, each time to a different piece of music.

Two judges independently scored each subject's performance. A score of 3.0 indicated all observed movements were in synchronization with the beat. A score of

2.0 indicated that some but not all movements were in synchronization. A score of 1.0 indicated that none of the beats were synchronized. Interjudge reliability was found to be high for both the pretest and the posttest ( $p < .001$ ). A nonequivalent control group design was used to measure the effects of each variable.

### Summary of Results

The percentage of subjects ( $N=54$ ) who were able to demonstrate rhythmic competency was small. To be considered rhythmically competent at any given task, a subject had to receive a score of 3.0 from both judges for both attempts at the task. At the pretest level, the highest percentage was for Task 4 (walking in place), with 20.4% of subjects able to demonstrate rhythmic competency. Only 1.9% of subjects were able to demonstrate rhythmic competency for all six tasks on the RCAT. Posttest data revealed considerable improvement, yet only half of the subjects (50%) were rhythmically competent at Task 4 (still the highest percentage of any task), and only 9.3% of the subjects were competent at all six tasks.

It was anticipated that the locomotor tasks (Tasks 5 - 6) on the RCAT would be more difficult to perform than the nonlocomotor tasks (Tasks 1 - 4). Results from the statistical treatment of data supported this assumption. Locomotor tasks were significantly more difficult than

nonlocomotor tasks ( $p < .05$ ), both at the pretest and the posttest level. During the treatment period the subjects made significant improvement in demonstrating rhythmic competency for all of the tasks on the RCAT, both nonlocomotor and locomotor ( $p < .05$ ).

Throughout the study, the control group scored higher than the experimental group on each of the RCAT tasks, but for nonlocomotor tasks the differences were not found to be significant at either the pretest or posttest level ( $p > .05$ ). However, for locomotor tasks the differences between the control group and the experimental group were found to be significant for the pretest level, with the control group performing significantly better than the experimental group ( $p < .05$ ). When the posttest was given there were no significant differences between the experimental group and the control group for any of the six tasks ( $p > .05$ ).

Although females scored higher than males on all of the RCAT tasks in the pretest and the posttest, gender was a significant factor for only one task. At the posttest level, it was shown that females performed significantly ( $p < .05$ ) better than males at Task 1 (patting bilaterally).

Instruction was found to be significant for both of the locomotor tasks ( $p < .05$ ). The experimental group showed significantly greater improvement than the control group at walking forward (Task 5) and at walking backward (Task 6).



There were no significant differences due to instruction for the nonlocomotor tasks (Tasks 1 - 4).

### Discussion

The results of the study yielded important information about the development of rhythmic competency among first graders. Pertinent points for discussion include the test instrument, the subjects, the treatment period, Weikart's method, the mean scores, the percentage of students demonstrating rhythmic competency, the effects of task alteration, the results of the analysis of variance for the pretest, the results of the analysis of variance for the posttest, the effects of instruction, and possible conclusions suggested by the data.

The Rhythmic Competency Analysis Test was crucial to the validity of the study. It was vital that the test be as reliable as possible. Fortunately, the judges were committed to the project and willing to undertake the time consuming task of individually testing every subject. Results of the computation of Pearson correlation coefficients showed interjudge reliability to be high ( $p < .001$ ) for both the pretest and the posttest.

One of the difficulties encountered in gathering the data was finding adequate space within the two elementary school buildings to administer the tests. It would have provided better control if all of the subjects had been

tested in the same place. Unfortunately, this proved to be impossible. School B did not have any empty classrooms, and therefore testing was done in a variety of places on a space available basis. There was always a classroom available at School A, but not always the same one.

Another possible confounding variable was the time of day that each subject was tested. It would have been ideal to test all of the subjects at the same time. With young children, testing during the morning hours would have been best. However, finding times when the children were available was a problem because of the numerous activities scheduled in each of the elementary classrooms. Despite excellent cooperation from staff members, attempting to work around reading times, special classes, recess, lunch, and field trips was very frustrating. Sometimes students were absent on the day the test was to be given. The judges found it necessary to test at a variety of times in order to meet with every child in the study.

It took a month to complete the pretest and nearly six weeks to complete the posttest. The sheer volume of time required to complete each test period may have influenced the results. Using several teams of judges would have hastened the process but might also have threatened the reliability of the test scores.

While there was general satisfaction with the structure of the test itself, there was some concern over the scoring

method. A larger range of scores might have yielded stronger data. A method whereby every correctly synchronized beat would be counted (a range of 1 to 16) would have been ideal, but attempts during the pilot test to count each beat failed to produce reliable results. No doubt a more precise scoring method would have required video taping or sophisticated electronic equipment. The scoring method used in this study, though limited in precision, proved to be both reliable and practical. The training required for the judges was minimal. Administering the RCAT required very little equipment and almost no financial investment. The simplicity of the test instrument should encourage replication by other music educators.

The practicality of the testing method and of the treatment plan was a primary consideration in the design of this study. The need to pursue research within the "real world" of the public school, and thereby assure applicability, was the overriding factor in the decision to accept both the constraints of the RCAT scoring method, and any possible threats to the study encountered in trying to administer the tests under difficult conditions.

The subjects for the study were 60 first graders from two elementary schools in Des Moines, Iowa. Their cooperation in performing the RCAT tasks was crucial to the success of the study. Young children are easily disturbed by outside influences or changes in their routine. Any

number of factors can affect their performance.

Fortunately, the responses from the subjects to the test were quite positive, and it is likely that the judges were able to get the best possible results from each participant. The test was not complicated or stressful, and by testing each subject individually, distractions were kept to a minimum. In addition, the judges were music education majors, and quite adept at helping the children to feel at ease.

The experimental group was selected randomly from among the 118 first graders enrolled at School A ( $n=30$ ). The control group was selected randomly from among the 93 first graders enrolled at School B ( $n=30$ ). Each group was evenly divided between males and females. Both groups received similar music instruction, but the control group received a greater number of minutes of instruction per week. No attempt was made to control for this difference in amount of music instruction or for differences in musical background, musical ability, or general intelligence. Any of these factors may have influenced the final results.

Both the control group and the experimental group had three children move away during the course of the study, so that the final number of subjects was 54 (26 males and 28 females). It is interesting to note that while the first thirty subjects selected for the experimental group agreed to participate, seven of the first thirty subjects selected

for the control group refused and had to be replaced. The music teacher at the school reported that most of the students who declined to participate were part of the ESL (English as a Second Language) program at School B. She felt that their parents may have had difficulty understanding the informational letter describing the study and therefore chose to withhold their permission. It is unclear whether or not this factor had any impact on the final results, though one might speculate that less able students would be more likely to decline, while highly motivated students might readily agree to participate, creating a higher than normal mean score.

The limited size of the sample may have had an impact on the final results. The tremendous amount of time necessary to test each subject individually made a larger sample prohibitive. Although the results allow one to draw a number of conclusions about the subjects in the study, it would be presumptuous to make any generalizations about all first graders based on such a small sample.

The treatment period consisted of approximately 25 training sessions using Weikart's sequential approach to rhythmic movement. Treatment took place over a four-month period. Each training session lasted from five to ten minutes and was incorporated into the regularly scheduled music class. The researcher, who was the music teacher at

School A, was the instructor. The instructor was not aware of which children were participating in the study.

The students in the experimental group at School A received 30 minutes of music instruction every Thursday and alternate Fridays (an average of 1 and 1/2 periods per week). Training sessions occurred once or twice per week, but never more often. It was difficult to maintain continuity when the treatment often took place only once per week. In addition, the treatment period included the Thanksgiving and Christmas holidays, Spring Break, and four days for Parent-Teacher Conferences, resulting in additional interruptions.

Because the subjects were selected from among the five first grade classes at School A, it was impossible to provide identical treatment to all of the subjects. No attempt was made to record the number of absences for each subject, but interruptions in the schedule that caused an entire class to miss their regularly scheduled music period were noted. The two first grade classes that had music in the morning received all 25 training sessions, while the afternoon classes missed several sessions. Although every class received at least 20 training sessions, greater consistency might have resulted in improved test scores.

The control group at School B had music more often (twice per week) and experienced fewer interruptions in their instructional schedule than the experimental group.

Their music teacher was assigned to only one building, while the instructor for the experimental group taught music at two buildings and was occasionally called away from School A for special events at the other building.

Music instruction at the elementary level usually includes some rhythmic movement activities (clapping, patting, playing percussion instruments, playing movement games, etc.). It is likely that the control group enjoyed some benefit from their music instruction even though there was no attempt to provide specific instruction in rhythmic movement. An effort to equalize the amount of music instruction between the experimental group and the control group might have produced different results.

The five-minute time period allotted for each training session was both adequate for the required activities and well suited to the attention span of first graders. The short training periods also made it possible to continue the regular music curriculum with little interruption. However, more frequent sessions would have been desirable and might have resulted in more significant improvement by the experimental group. Gordan (1981) has suggested that three meetings per week constitute the ideal arrangement for teaching melodic and rhythmic concepts to primary age children.

It is certainly possible to speculate that more frequent training sessions might have changed the final

results. Better continuity of instruction might also have made a difference in RCAT scores. In addition, it would have been desirable to have extended the treatment period to a full school year. The analysis of data showed that instruction was significant for the most difficult tasks. The easier nonlocomotor skills may have come under the influence of a ceiling effect, whereby improvement was more difficult to measure. Perhaps a longer and more consistent treatment schedule would have showed instruction to be significant in the improvement of nonlocomotor task scores as well.

Generally, the problems associated with the treatment period were unavoidable. The timeline of testing and treatment was determined by the guidelines for research projects established by the Des Moines School District. The guidelines did not permit any testing during the months of September or May, and the lengthy period of time needed to administer the RCAT limited the time left for the treatment period. The assignment of staff and students, along with the scheduling of music classes, was also at the discretion of the school district.

The restrictions were accepted in order to design a study with direct application to music classrooms. Teachers in the public schools are no strangers to interruptions, lack of time, and lack of continuity. It was felt that a method that could succeed in the classroom under these



circumstances would be recognized by teachers as having genuine merit.

Weikart's method was simple to implement and produced few difficulties. Lesson plans were taken directly from Weikart's book Music Plus Movement (1985), an activity guide especially designed for children ages three to seven. Typical activities included visually and/or aurally decoding movement tasks, and describing, sequencing, and creating movement activities.

Generally, the movement tasks were practiced first without any imposition of beat. When a group beat was imposed, the following process usually was observed:

- (1) performing the task while verbally describing the movement or the body part; e.g. saying the word "pat" or the word "head" each time the student patted his or her head,
- (2) performing the task while whispering the verbal description, and (3) performing the task while thinking the verbal description. When most students could maintain a steady beat using step three, music was added.

The activities and the accompanying musical selections were well received by the students. After the treatment period ended the students frequently requested to repeat the activities. The lesson plans were clearly outlined in Weikart's book and required little preparation on the part of the teacher. The only equipment required was a cassette player and a number of taped musical selections.

Weikart has provided a series of recordings that can be used with her method, and these recordings were used in the study. However, it would certainly not have been necessary to use these particular recordings if other appropriate music had been available in the music classroom. Weikart's method is compatible with a traditional music program, requires only a minimal commitment of time from students and teachers, and is very economical. All of these factors should make it quite attractive to music educators.

Mean scores were computed for each task by averaging the scores given by both of the judges for each of the two attempts made by the subject. For example, a subject was asked to pat his or her legs with both hands at the same time (Task 1) in synchronization with the beat of the first musical selection ( $\text{♩}$ =132). Later in the test he or she was asked to perform the same task to another musical selection ( $\text{♩}$ =120). The subject was assigned a score for each task by both judges. Therefore, the mean score for each task represents four scores for each subject.

Examination of the mean scores reveals several interesting points. The standard deviation for all of the mean scores is rather high considering the narrow range of the scoring method used in the RCAT (1.0 - 3.0). The raw data reveal that the spread of scores is indeed wide. Some subjects were able to perform every task perfectly at the pretest level, while others were unable to perform any of

the tasks correctly even at the posttest level. It is obvious to educators who work regularly with young children that when dealing with a developmental skill such as rhythmic coordination, these widely differing ability levels are to be expected.

In the pretest, the control group scored higher than the experimental group on every task except Task 1 (patting bilaterally). At the posttest level, both groups showed improvement at every task. The experimental group no longer scored higher than the control group on Task 1, but produced higher mean scores for Task 5 (walking forward) and Task 6 (walking backward). It is interesting to note the sharp decline in the mean scores as the tasks changed from nonlocomotor (Tasks 1 - 4) to locomotor (Tasks 5 - 6).

Females scored better than males for every task on the RCAT in both the pretest and posttest. Weikart's concern for the development of rhythmic competency among males appears to be well founded. While further research is needed to establish a significant difference between rhythmic ability in males and females, these descriptive statistics do suggest that educators should be prepared to provide additional help and encouragement to their male students.

Weikart speculates that the differences between males and females are due to the way boy and girls are socialized in our society. Girls tend to participate in a greater

variety of rhythmic activities (jumping rope, playing jacks, hopscotch, dancing lessons, etc.) than do boys. Parents and educators must guard against sex role stereotyping that might inadvertently deprive boys of rhythmic movement experiences.

The percentage of students demonstrating rhythmic competency at the beginning of first grade was quite small. The percentages were much smaller than those reported by Weikart (1982). She found that 61% of first graders were able to pat their legs to the underlying steady beat in a piece of recorded music. In this study, only 18.5% of the subjects were able to perform the same task (Task 1). Weikart also reported that 34% of first graders were able to walk the beat, while in this study only 9.3% were rhythmically competent at walking forward (Task 5).

While these percentages are only descriptive and cannot be used to draw inferences, they suggest the existence of a serious problem. Weikart's position on the lack of rhythmic competency among primary age children appears to be accurate. The subjects in this study did not demonstrate a high degree of rhythmic competency, even at the posttest level.

It should be noted that the music curriculum for first graders in the Des Moines Public Schools, like most traditional music programs, includes numerous activities that demand rhythmic competency. Activities such as playing

a steady beat or a rhythmic ostinato on an instrument, performing play-parties and singing games, echoing rhythmic patterns, and learning to read rhythmic notation, all require the ability to synchronize movements to an external beat. Greater attention should be paid to developing rhythmic perception and rhythmic competency before introducing more complex musical activities.

The effects of task alteration proved to be quite dramatic. At the pretest level, locomotor tasks were significantly more difficult to perform than nonlocomotor tasks ( $t=6.09$ ,  $p<.001$ ). At the posttest level there was some lessening of effect, but the results still showed locomotor tasks to be significantly more difficult than nonlocomotor tasks ( $t=2.74$ ,  $p<.01$ ).

These results support the findings of other studies that locomotor skills develop more slowly in children than do nonlocomotor skills (Rainbow and Owen, 1979; Schleuter and Schleuter, 1984; Weikart, 1982). They also support Weikart's belief that children in contemporary American society do not receive sufficient practice in locomotor skills because they are more often involved in passive rather than participatory learning activities.

While the results of this study underscore the need to provide more practice in locomotor activities for children in the primary grades, both the space and the opportunities needed to pursue such activities are often limited. There

is a growing emphasis on academic learning in preschools and kindergartens, an emphasis that is pushing free play from the curriculum. In the music room, teachers have such a small amount of time allotted to cover such a broad curriculum, that activities such as walking, skipping, and running are frequently ignored. Physical education classes usually emphasize sport at the expense of skill development. When children are at home, safe areas for locomotor play are often unavailable, and those activities that do exist are often competitive team sports rather than the type of free play that encourages gross-motor development.

Despite these concerns, it is encouraging to note that the results of the  $t$  tests showed that the subjects in the study made significant improvement during the treatment period in performing both nonlocomotor and locomotor tasks,  $p < .001$ . The subjects could perform the tasks on the RCAT better in April than they could the previous October. Since the results of the MANOVA later showed that there were no significant differences as a result of instruction for Tasks 1 - 4, it is possible to speculate that the primary cause for the gains made for nonlocomotor tasks was maturation.

The positive effect of maturation on rhythmic development is cited by numerous experts (Delorenzo, 1983; Frega, 1979; Rainbow and Owen, 1979), and certainly is supported by the improvement in nonlocomotor tasks measured in this study. Educators would be wise to allow time for

maturation to occur before introducing more difficult tasks such as playing rhythm patterns or reading notation. Further research might be able to pinpoint the optimum age for the introduction of these more advanced rhythmic activities, but it is already clear that first grade is too soon for many children.

Weikart believes that music teachers are impeding the development of rhythmic competency by confusing students with complex rhythmic tasks before they have mastered a steady beat. In her study with first graders in Romulus, Michigan (Weikart et al., 1987) she specified that the music instructors for the experimental group not assign the performance of any rhythm patterns to their students. Weikart felt that the inclusion of patterns that require students to subdivide the beat would delay their progress toward becoming beat competent. The experimental group in that study made significant gains ( $p < .005$ ) in their mean scores for all RCAT tasks. Similar prohibitions were not imposed in this study, but considering the remarkable results of the Romulus project, Weikart's suggestion to avoid rhythmic patterns until beat is established should be considered by music educators.

The results of the analysis of variance for the pretest revealed that there were no significant differences between males and females. Although females consistently scored higher than males, the differences were too small to be

statistically significant. A larger sample might have yielded different results. It is interesting to note that for Task 2 (patting the legs, alternating hands),  $F$  values produced a significance level of  $p=.066$ . Similarly, for Task 6 (walking backward) the ANOVA produced a significance level of  $p=.067$ . While these figures are beyond the .05 level of significance required to reject the null hypothesis concerning gender, they do suggest the need for further investigation of the issue.

The results of the ANOVA also showed no significant differences between the experimental group and the control group for Tasks 1 - 4 (the nonlocomotor tasks). However, the analysis of data revealed that the control group performed significantly ( $p<.05$ ) better than the experimental group at Task 5 and Task 6 (the locomotor tasks).

Because the subjects were chosen randomly from two similar populations, no significant differences between the groups had been expected. The instructor for the control group had been the music teacher for all of the subjects during their kindergarten year, so it was assumed that no major differences existed in the musical activities the two groups had experienced at school. None of the subjects had experienced Weikart's method. However, because the control group was selected from a school with a higher socioeconomic level than was the experimental group, differences might exist in their home musical experiences.



Some studies have suggested that general academic ability is a predictor of musical achievement (Hedden, 1982; Ismail, 1975; Wolff, 1980). Perhaps matching the experimental and control groups for academic ability through examination of standardized test scores would have yielded different results. Attitudes toward school, especially toward movement activities, could also have been a factor in the differences between the two groups at the pretest level.

The results of the analysis of variance for the posttest showed that females were able to perform Task 1 (patting bilaterally) significantly better than males ( $p < .05$ ). There were no significant differences between males and females for Tasks 2 - 6. It should be noted that the  $F$  value for Task 4 (walking the feet while seated) produced a significance level of  $p = .06$ . While this is not sufficient to reject the null hypothesis, it is further evidence that there may be a connection between gender and rhythmic competency.

The results of the ANOVA also showed that there were no significant differences between the experimental group and the control group at the posttest level for any of the RCAT tasks. It is interesting to note that the differences between the two groups found in the pretest for Tasks 5 and 6 had apparently disappeared. Even at this early point in the analysis of data, it was possible to speculate that treatment had produced some kind of positive effect.

The effects of instruction were measured through administration of a MANOVA. The results showed that there were no significant differences between the gains made by the experimental group and those made by the control group for Tasks 1 - 4 on the RCAT. However, for Tasks 5 and 6, the experimental group made significantly better progress than the control group ( $p < .01$  and  $p < .05$  respectively). The experimental group had been able not only to close the gap between their performance and that of the control group for these two tasks, but had actually surpassed the control group. It is particularly noteworthy that the improvement was made on the most difficult tasks.

The introduction of Weikart's sequential approach to rhythmic movement was effective in significantly improving the ability of first graders in this study to walk forward and backward to the underlying beat in a piece of recorded music. It is likely that rhythmic training using Weikart's method would be a useful component of music and physical education classes for primary age children.

Conclusions drawn from the analysis of data include those concerning the design of the study, the general level of rhythmic competency in the sample group, the effects of task alteration, the effects of gender, and the effects of instruction.

The general design of the study was sound, but could be improved by increasing the size of the sample, equalizing

the amount of music instruction received by the experimental and control groups, and increasing the frequency and total amount of treatment. The test instrument proved to be both valid and reliable but had some limitations due to its narrow scoring range. A number of problems arose as a result of attempting to do the study within the constraints of a school environment, but it was concluded that the limitations were acceptable in order to preserve the applicability inherent in a field study.

Only a small percentage of the first graders in the study was consistently able to demonstrate rhythmic competency. Because the lack of rhythmic competency is a serious impediment to the performance of other musical skills, greater emphasis should be placed on developing rhythmic competency in primary music classrooms. In addition, the scope and sequence of the elementary music curriculum should be examined to assure that the activities assigned are appropriate to the developmental level of the students. Time for maturation must be allowed. Students should be able to perceive and perform a steady beat before attempting more complex rhythmic activities.

Task alteration was a significant factor in the ability of the first graders in this study to demonstrate rhythmic competency ( $p < .01$ ), with locomotor tasks being more difficult than nonlocomotor skills. Greater emphasis should be placed on providing primary-age children with locomotor

movement opportunities. Physical education specialists, music specialists, classroom teachers, and parents must work together to provide these opportunities.

Although females scored higher than males for every task on the RCAT, there were no significant differences between the ability of males and females to demonstrate rhythmic competency for most tasks. However, posttest mean scores for Task 1 did reveal a significant difference between males and females,  $p < .05$ . These mixed results indicate the need for further study to clarify the effect of gender upon rhythmic competency. It is likely that boys in the primary grades will have more difficulty with rhythmic movement tasks than girls.

There were no significant differences as a result of treatment for Task 1 - 4 (the nonlocomotor tasks), but it is possible that longer and more frequent treatment might have proved effective. There were significant differences as a result of treatment for Tasks 5 and 6 (the locomotor tasks),  $p < .05$ , and therefore it can be concluded that a sequential approach to teaching rhythmic movement is effective in improving rhythmic competency in primary-age children.

### Summary

The purpose of this study was to answer the following questions:

1. Will instruction based on Weikart's sequential approach make a significant ( $p < .05$ ) difference in the number of children who can demonstrate rhythmic competency?
2. Will gender make a significant ( $p < .05$ ) difference in the number of children who can demonstrate rhythmic competency?
3. Will altering the movement task make a significant ( $p < .05$ ) difference in the number of children who can demonstrate rhythmic competency?

A review of the final results provides a partial answer to each of these questions. Instruction was a significant factor in the development of rhythmic competency for Tasks 5 and 6 on the RCAT ( $p < .05$ ). Gender was a significant factor in the ability to demonstrate rhythmic competency for Task 1 ( $p < .05$ ). Task alteration (changing from nonlocomotor to locomotor movements) also made a significant difference in the ability of first graders to demonstrate rhythmic competency ( $p < .05$ ).

This study also sought to test the following null hypotheses:

1. There will be no significant ( $p = .05$ ) difference in the ability of students to demonstrate rhythmic competency as a result of instruction using Weikart's sequential approach to rhythmic movement.

2. There will be no significant difference ( $p=.05$ ) in the ability of students to demonstrate rhythmic competency as a result of gender.
3. There will be no significant ( $p=.05$ ) difference in the ability of students to demonstrate rhythmic competency as a result of task alteration.
4. There will be no significant ( $p=.05$ ) interaction between gender, task alteration, and instruction.

The results of the data indicate that hypothesis 1 can be rejected for Tasks 5 and 6 because the experimental group made significantly better gains in RCAT scores than the control group ( $p<.05$ ). For all other tasks the hypothesis stands since there were no significant differences in scores due to instruction. Hypothesis 2 is rejected for Task 1 because females scored significantly higher than males ( $p<.05$ ). For all other tasks the hypothesis stands because there were no significant differences between the mean scores of males and females. Hypothesis 3 is rejected because locomotor movements were shown to be significantly more difficult than nonlocomotor movements, both for the pretest ( $p<.001$ ) and the posttest ( $p<.01$ ). There was no significant interaction between variables, and therefore hypothesis 4 is accepted.

A final review of the results suggests that synchronizing body movements to the underlying beat in a

piece of music is a difficult skill for first graders to perform. It requires both time and practice in order to develop. It is more difficult for boys than for girls, and more difficult to do while moving through space than while sitting in a chair. Instruction that makes a significant difference in the ability of first graders to demonstrate rhythmic competency can be provided within a regular music curriculum in a limited amount of time. The instruction does not require expensive equipment or lengthy preparations on the part of the teacher. Existing music education programs can assist children in mastering rhythmic competency, and provide that assistance efficiently.

#### Recommendations for Future Research

No research study can expect to provide definitive answers to a problem. In this study, for example, both gender and instruction proved to be significant factors in the development of rhythmic competency, but not for every task. Obviously, such results make it impossible to draw final conclusions without replication studies to generate additional data. In addition to the need for replication, the related literature suggests a number of variables that were not examined in this study. Motor development is a vastly complex subject, and there is ample room for additional research that would explore other aspects of rhythmic movement. The area of beat competency alone

provides a myriad of possibilities. This section of the study will examine the possibilities for future research, both replication studies and research involving other variables.

Replication studies are necessary in all areas of research to insure the validity of results. Although the general design of the study was satisfactory, educators wishing to do similar research may wish to consider making several changes in the methodology in order to generate stronger data.

A larger sample should be selected in order to generalize results more confidently. Testing should be done in one location and at the same time of day. Several teams of judges could be used in order to reduce the amount of time required to administer the RCAT, although pilot testing would have to be done to insure interjudge reliability.

It would be preferable to select the subjects from one school, where each subject could receive the same amount of music instruction. The subjects should not have had any previous experience with Weikart's approach. Someone other than the music teacher should provide the treatment. The treatment period should last a full school year, and training sessions should occur at least twice, preferably three times per week.

It would be very useful to compare the results of similar studies done with both younger and older students.



Adults, preschoolers, adolescents, and the handicapped (physically, mentally and emotionally) would all be interesting populations to study. A similar study could also be repeated as part of a physical education class or regular self-contained classroom to determine if instruction presented in a different setting would be more or less effective.

A logical addition to a rhythmic competency study would be a follow up investigation involving only those subjects who were identified as having rhythmic difficulties (perhaps those with a mean score of less than 2.0 for All Tasks Combined). Other studies have suggested that instruction is sometimes most significant for low achievers. Perhaps Weikart's method would have its greatest impact upon children having serious rhythmic coordination problems.

Changes in the test instrument might be considered before undertaking a replication study. It would be possible to improve the scoring method of the RCAT, and thereby generate stronger data if each subject's performance was video taped. By slowing the tape it might be possible to count the number of synchronized beats, creating a larger range of numbers. However, it should be remembered that the presence of video cameras might influence the results by making the subjects more self-conscious.

The type of tasks required on the RCAT could also be altered to make them more directly applicable to music.

Subjects might be asked to play a steady beat on a variety of musical instruments, or to sing or speak a steady beat.

Research involving other variables might include attempts to measure the impact of attitude, musical achievement, and general intelligence upon the ability to demonstrate rhythmic competency. Weikart is currently attempting to measure the correlation between improvement in RCAT scores and improvement in academic subjects (reading and math). Other correlation studies might involve comparing the musical achievement, musical skill level (both vocal and instrumental), self-concept, attitude toward school, and creative abilities of children receiving movement instruction and those receiving no instruction.

Because the lack of rhythmic competency seems to be so prevalent among young children, it might be useful to attempt to identify the reasons why children do not develop rhythmic competency by the time they go to school. Areas to explore might include the physical, emotional, or psychological history of each subject; the home environment of the subject, especially parent attitudes toward music and movement, types of entertainment preferred by the family, the presence of musical instruments or equipment in the home, and the rhythmic competency level of parents and siblings; child-rearing practices used by the parents, including the amount of time allowed for watching television and the amount of time allowed for free play; the physical

location of the subject, including differences in rural and urban children, or children with access to parks and large backyards, and those living where open spaces are not readily available; and family structure, including the impact of single parent families and working mothers.

Longitudinal studies involving a comparison between styles of parent-infant interaction and a child's later ability or lack of ability to perceive the beat in music would provide fascinating insights into the role that early experiences play in motor skill development. It would be possible to implement Weikart's method with infants and explore the reasons why some children are rhythmically competent at age four, and others are not competent even as adults. Perhaps educators can learn to identify high risk children while they are still very young.

Socioeconomic factors are strong predictors for school achievement. Federal programs such as Headstart and Chapter I are predicated upon the belief that intervention can be helpful to children at high risk for school failure. Studies could be undertaken to determine if socioeconomic factors are at work in the development of rhythmic competency.

Physical education teachers might wish to examine the impact of rhythmic competency upon skills used in sports. Weikart maintains that there is a connection between rhythmic competency and the eye-hand coordination needed to

hit a baseball, or kick a soccer ball. A study examining rhythmic competency in athletes would help to clarify the connection, if any, between sports and music.

Although Weikart's method was successful at improving rhythmic competency, other methods might be equally, or even more effective. Numerous other methods of rhythmic movement are available that could be tested to determine their effectiveness. While Weikart's method is a sound and highly pragmatic approach, teachers with differing backgrounds in movement training may wish to have a number of approaches from which to choose. A study in rhythmic competency comparing various teaching methods would be very valuable.

The lack of rhythmic competency is a fascinating topic for discussion. It is a frustrating source of confusion for educators, a serious handicap for young children in their music and physical education classes, and a source of embarrassment for many adults. The possibilities for further study are as exciting as they are unlimited.

#### Educational Implications

The results of this study suggest a number of important implications for music educators. It is imperative that a number of steps be taken if the level of rhythmic competency in primary age children is to improve. Educators must first concern themselves with the assessment of rhythmic competency levels among the children with whom they work.

They must then realize the importance of incorporating a systematic approach to building rhythmic competency in their classrooms. As teachers develop programs for building rhythmic competency they must consider also the effects of gender on rhythmic competency and the importance of a nonlocomotor to locomotor sequence of rhythmic movement development. Finally, teachers who make a commitment to teaching rhythmic competency should consider the implications of Weikart's philosophy on other activities in the music curriculum.

The assessment of rhythmic competency levels must be the starting point for any effort to improve the dismal state of rhythmic coordination among young children today. Teachers can begin the difficult task of helping children to be rhythmically competent by first determining the level of competency that currently exists in their own classroom. A revised form of the RCAT can be used to screen students at the beginning of each school year. Teachers may be shocked to discover that less than half of their first graders can perform even the simplest task to an external beat, but once teachers recognize the magnitude of the problem, steps can be taken to solve it.

The importance of incorporating a systematic approach to building rhythmic competency into the music classroom is supported by the results of this study. Instruction can be effective in improving the ability of children to

demonstrate rhythmic competency. Music teachers must familiarize themselves with the important tenets of Weikart's philosophy and strive to educate their colleagues in the importance of a sequential program of movement activities in the early grades. For preschool, kindergarten, and first grade classes, five to ten minutes of each music period should be spent in movement activities specifically designed to promote rhythmic competency.

The method developed by Phyllis Weikart is an ideal choice for beginning a rhythmic movement program in the schools. It is sequential, practical, and motivating to young students. It is simple to use and highly adaptable to any music program. Teachers wishing to implement a program for developing rhythmic competency would be wise to examine Weikart's latest publication, Round the Circle: Key Experiences in Movement for Children Ages 3 to 5 (in press). In addition, Weikart's method has been incorporated into the new elementary music book series, The World of Music, published by Silver, Burdett and Ginn (Palmer et al., 1988).

The effects of gender, although not conclusively confirmed by this study, should be a primary consideration for any teacher beginning a rhythmic movement program for primary age children. Educators already are aware that boys do not develop physically as quickly as girls. They should be aware also that boys may be slower to develop rhythmically. Teachers must be sensitive to the special

needs of male students. Through appropriate modeling, careful structuring of the learning environment, and attention to sequence, all children can experience success with movement activities. Teachers must be willing to allow children, especially boys, the time they need to develop rhythmic competency in a classroom setting that is accepting and safe, even for the uncoordinated.

The importance of a nonlocomotor to locomotor sequence of rhythmic movement development is clearly supported by the results of this study. Music teachers must be aware of the proper sequence for rhythmic skill development. Students are more likely to succeed if they are allowed to begin with the tasks that are easiest. Starting with nonlocomotor movement will provide the foundation necessary to build the more difficult locomotor skills. Once nonlocomotor skills are firmly established, teachers must provide greater opportunities for children to practice locomotor skills.

The effects of Weikart's philosophy on other areas of the music curriculum are far reaching. It is an unfortunate fact of music education that being rhythmically competent is a skill that is often assumed rather than taught. Music curricula in the primary grades generally include a multitude of activities that require rhythmic competency, yet give little attention to insuring that students are indeed able to perceive and match a steady beat. This study has identified a number of factors that should encourage

music educators to reassess their teaching practices with young children.

Teachers should avoid the introduction of more complex rhythmic activities until rhythmic competency is firmly established. Young children should not be expected to sing a song and play a steady beat at the same time. They should not be expected to perform folk dances or singing games with accuracy. They should not be asked to play ostinato patterns. The study of rhythmic patterns should wait until second grade, later if many of the students are not rhythmically competent.

Weikart's philosophy has numerous implications for activities using instruments. When teaching children to play instruments, bilateral motions should precede alternating motions. Teachers should avoid specifying right or left hand. Language cues should be used to reinforce the beat. A "say and do", "whisper and do", and "think and do" sequence should be used to help students internalized the pulse. Opportunities must be given for children to practice without the imposition of an external beat before adding music. When music is added, vocal music should be avoided so that children are not distracted by the rhythm of the text.

In addition to extended practice in performing a steady beat, special practice in aural and visual decoding is essential to the development of good instrumental technique.



Children should be asked to describe what they are doing with their hands or how they are holding a particular instrument. They should have opportunities to explore and experiment before they are expected to be "correct".

Teachers should remember that all classroom activities need to be reexamined when using a sequential approach to movement. Some highly complex activities are assumed to be simple because they are traditional. For example, clapping is a very common music class activity, but when analyzed carefully, it is found to be a highly complex movement. It requires children to inhibit the motion of one hand while moving the other. Practicing a steady beat by patting both hands on the legs or shoulders will produce much better results than clapping. Other common classroom activities require similar analysis if teachers hope to facilitate rather than frustrate their young students.

A final conclusion concerning rhythmic competency can only be made by first identifying the goals our nation holds for education in general, and for music education in particular. If the purpose of public education in the United States is the development of basic competencies, including aesthetic competencies, then the goal of music education is to assist students in becoming musically competent.

But what does it mean to be musically competent? One definition of competence is "to rightfully belong." The

goal of music education is that every child experience sufficient success in musical activities to know that they "rightfully belong" in the world of music.

The successful performance of any musical activity, whether singing, playing an instrument, or dancing, begins with the ability to synchronize individual movements to an external pulse. This skill, so basic to musical expression that professional musicians often assume it is innate, is the key to success in musical performance. When music educators succeed in teaching rhythmic competency they help their students to rightfully belong, and thereby more fully experience the world of the aesthetic.

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## APPENDIX A

## RHYTHMIC COMPETENCY ANALYSIS TEST

The Rhythmic Competency Analysis Test is designed to assess an individual's ability to perform a movement task in synchronization with the underlying beat in a piece of music. Students are to be tested individually in a location away from any distractions. Both tester and student should be seated. Put the student at ease with friendly, relaxed conversation.

Use a tape recorder and two cassette tapes containing instrumental music with a strong steady beat. The first selection should have a tempo of approximately ♩ =132. The second selection should have a tempo of approximately ♩ =120.

Note. From Teaching Movement and Dance: A Sequential Approach to Rhythmic Movement (p.327) by Phyllis S. Weikart, 1982. Ypsilanti, Michigan: High/Scope Press. Copyright 1982 by the High/Scope Educational Research Foundation. Adapted by permission.

Steps

1. Ask the student to play follow-the-leader with you. Lead the student through a sequence of patting the thighs with hands together, patting the thighs with hands alternating, walking the feet while seated, walking in place, walking forward, and walking backward. Do each movement for at least sixteen beats.
2. Test the student's understanding of the task by asking him or her to be the leader. Encourage large, clear movements.
3. Say to the student, "We are going to listen to a piece of music that has a steady beat. After we have listened for a while you may begin whenever you like to pat the steady beat on your legs using both hands." The tester may provide the student with further explanations but should not make any visible movements that might indicate the beat.
4. Repeat step three using the same music. Ask the student to alternate his or her hands. (They may start with either hand.)

5. Say to the student, "We are going to listen to the same piece of music again. This time when I give the signal, walk your feet to the steady beat. Remember, you may begin anytime you like after listening for the steady beat."
6. Ask the student to stand up. Repeat step four walking in place.
7. Repeat step four, asking the student to walk forward. The tester should also indicate the general pathway the student should follow, e.g. "along this wall", "to the door", "beside this line on the floor", etc. Be sure that the student has ample room to walk for at least sixteen beats.
8. Repeat step four, asking the student to walk backwards.
9. Repeat step three using the second musical selection.
10. Repeat step four using the second musical selection.
11. Repeat step five using the second musical selection.

12. Repeat step six using the second musical selection.

13. Repeat step seven using the second musical selection.

14. Repeat step eight using the second musical selection.

### Scoring

Record the student's identification number and sex. The two testers should independently score each task on the TEST FORM. To score each task, observe the first sixteen beats of each task performed, beginning with the student's first movement. Each task is scored on a scale from one to three, using the following criteria:

3 = all 16 consecutive movements in synchronization with the beat of the music.

2 = some but not all movements in synchronization with the beat of the music.

1 = no movements in synchronization with the beat of the music.

## TEST FORM

School \_\_\_\_\_

Date \_\_\_\_\_

I.D. #									
Sex									
Pat bilaterally									
Pat alternating									
Walk seated									
Walk standing in place									
Walk forward									
Walk backward									
Pat bilateral									
Pat alternating									
Walk seated									
Walk standing in place									
Walk forward									
Walk backward									

## APPENDIX B

## LETTER TO PARENTS

September, 1986

Dear Parents:

I am conducting an informal research project concerning the ability of first grade students to move to the steady beat in music. This project will involve individually testing sixty first graders from Rice and Moore Elementary Schools. Each child will be asked to clap and to walk to the steady beat in a recorded musical selection. Testing will be done once in October and again in March. Each test will take approximately 15 minutes and will be conducted by two Drake University music students during the regular school day.

I have randomly selected fifteen boys and fifteen girls from each school. Your child's name was among those drawn. The test is very simple and complete confidentiality will be maintained. This project has the approval of the Des Moines Public School District and the cooperation of the building principals and teachers. Of course your child's participation is completely voluntary. If you would prefer that your child not participate, simply notify their homeroom teacher. If you have any questions, please contact me at Monroe School (255-2153), or at home (274-4567).

I believe that this research will be very helpful to teachers in determining how best to teach music. Your cooperation is greatly appreciated.

Sincerely,

Patricia B. Trump  
Music Teacher  
Monroe-Rice Elementary School